R E M A R K S

Applicants affirm the election of Group II.

To further distinguish over the art of record, the claims now require the total power applied to the parallel connected windings and the power applied to the windings of the coil to be varied. Such control enables applicants' control arrangement to achieve improved control over the plasma flux density supplied by a coil having plural parallel connected windings to the workpiece.

Claims 31-33 have been added. Claims 31-33 are apparatus claims corresponding with method claims 1-3. The only difference between claims 1-3 and 31-33, which are in Group II, is that the control steps claims 1-3 define are performed by the controller of claims 31-33. Consequently, the subject matter of claims 1-3 and 31-33 is not separate and distinct. In this regard, it has been consistently held that an apparatus for performing the same steps which are performed by hand does not render a claim unobvious.

Since the subject matter of claims 31-33 is not patentably distinct from the subject matter of claims 1-3, the inventions of claims 1-3 and 31-33 are not separate and distinct. Consequently, restriction between method claims 1-10 and apparatus claims 11-25 and 28-32 is improper and all these claims should be examined in the same application.

Claim 28 has been amended to obviate the rejection under 35

USC 112, ¶2. In amending claim 28 in this manner, claim 28 has been broadened. The subject matter of claim 28 is patentable over the art of record as discussed *infra* which indicates that the salient point of claim 28 is not rendered obvious by the art of record.

Claims 1, 5, 7, 11-13, 15, 17, 19-23 and 25 have been amended to more clearly indicate that the windings of the coil are connected in parallel and that the power and some other parameters are varied. Also, the applicants' claims are now infringed when the goods are sold, prior to being put into use. Previously, the claims could have been interpreted so that the coil windings were spatially parallel to each other.

Applicants traverse the rejection of claims 11-25 and 29 under 35 USC 112, ¶2. The Examiner's position with regard to the word "winding" is incorrect. The Examiner's statement that "it is well established in the art that a winding is simply a single turn of a wound material (i.e., coil)" is incorrect. A coil of a plasma processor is similar to a transformer coil because the plasma processor coil couples an inductive field to a load. A transformer includes one or more windings, such as a primary winding and a secondary winding. Each winding includes at least one, and usually many more, turns. Hence, a winding is not simply a single turn as the Examiner alleges.

If the Examiner persists in this rejection, she is requested

to cite a reference in support of her position. Attorney for applicants has used the terminology of a coil including plural windings, each having plural turns in many application which have matured into patents; see, for example, Holland et al, U.S. Patent 6,028,395, cited in the Information Disclosure Statement previously submitted in the present application. No prior objection to such terminology has ever previously arisen.

Applicants do not understand how item (3), page 3, of the Office Action is applicable to the claims of the present application. *Ex parte Wu*, 10 USPQ 2d 2031, 2033 (Board of Patent Appeals and Interferences, 1989) is applicable to the use of the term "such as" followed by narrow language. The words "such as" are not used in the claims of the present application in the manner alleged by the Examiner. Many claims are written in which broad language is followed by narrowing language. For example, it is a common practice for a dependent claim, which incorporates all features of its independent claim, to limit the subject matter of the independent claim. If the Examiner persists in this rejection, citation of a more relevant decision on the point is in order. The Examiner is reminded that the purpose of 35 USC 112, ¶2, is to enable the public to determine the scope of the claims. In the present instance, the scope of the claims is clear.

Applicants traverse the rejection of claims 11-16, 25 and 28-30 as being obvious as a result of Blalock et al, U.S. Patent

6,095,159, in view of Kiyoshi et al, Japanese Patent Publication No. 08-050998. There are several statements in the Office Action, particularly concerning the Blalock et al reference, which appear to be erroneous. Blalock et al does not disclose computer 42 controlling capacitor 36, nor does Blalock et al disclose the invention substantially as claimed, except for the variable impedance arrangements.

Claims 11-16 and 25, as well as newly added claims 31-33, require the coil to include plural parallel windings, which are now stated to be connected in parallel. The Blalock et al reference discloses the coil as a flat spiral coil; see col. 3, line 46, and the illustration of coil 34 in Fig. 2. Blalock et al also fails to disclose varying the total power that power source 32 applies to coil 34. Blalock et al, col. 3, lines 60-62, merely states, "computer 62 controls the various components which comprise the plasma processing apparatus." The Blalock et al drawing includes a line extending from computer control 42 to power supply 32. However, this does not mean that Blalock et al varies the output power of power supply 32. Blalock et al could be controlling many possible variables of the power supply, such as its voltage, current or frequency.

Blalock et al has no specific disclosure of variable capacitor 36 being controlled by control computer 42. The drawing has no line from control computer 42 to variable capacitor 36 and there is

no specific statement in the Blalock et al written disclosure to support the position of the Examiner in this regard.

Based on the foregoing, Blalock et al does not disclose the plural parallel connected windings and a controller for varying the total power a source supplies to such windings and variable impedance arrangements coupled with the plural parallel connected windings, as claim 11 recites. While JP Publication No. 08-050998 appears to disclose variable capacitors 18, neither reference provides the dual control specified by claim 11 in a coil having parallel connected windings. Consequently, claim 11 and the claims dependent thereon are clearly patentable over the art of record.

Claim 25 distinguishes over the art of record by requiring plural parallel connected windings of a plasma excitation coil to be coupled with impedance arrangements. The impedance arrangement coupled with each winding is arranged for controlling the value of a standing wave current in the respective winding. The frequency of a source for supplying power to the parallel connected windings and the lengths of the windings are such that there are no substantial standing wave current variations along the length of each winding. As previously noted, Blalock et al is deficient with regard to claim 25 because it fails to disclose parallel connected windings. In addition, Blalock et al has no disclosure of a source frequency and the lengths of the windings being such that there are no substantial standing wave current variations along the length of

each winding.

Claim 28 distinguishes over the art of record by requiring the frequency of a source for supplying power to a winding of a plasma processor coil and the length of the winding to be such that there are no substantial standing wave current variations along the length of the winding.

The Examiner's rationale with regard to the requirement for there to be no substantial standing wave current variations along the length of a winding ignores the requirements of claims 25 and 28 for the source frequency and the length of the winding to be such that there are no substantial standing wave current variations along the length of the winding. In addition, the Examiner's reasoning on this issue is improper.

As is well known to electrical engineers, a standing wave current along a line represents the root mean square (RMS) current as a function of location along the length of the line. For example, a quarter wavelength line having a characteristic impedance equal to the characteristic impedance of a source driving the line has a standing wave current that has the same shape as a quarter of a cycle of a sine wave along the length of the line. If the quarter wavelength line is terminated by an open circuit, the RMS current at the terminals of the line connected to the source has a maximum value and the RMS standing wave current at the end of the line has a zero value. If the quarter wavelength line is

terminated by a short circuit, the RMS current at the termination has a maximum value and the RMS current at the terminals of the line connected to the source has a zero value. The variations of the standing wave current between the termination and the source terminals are in accordance with a sine wave. Hence, claims 25 and 28 indicate that the frequency of the source and the length of the line are such that the standing wave current in the line does not have a substantial variation, such as just previously described.

The Examiner's position as set forth in the first paragraph on page 5 of the Office Action that failure to change the value of the variable capacitor 36 of Blalock et al results in no variations in the standing wave current along the length of the winding is thus incorrect. Further, applicants note that Blalock et al fails to disclose any relationship between the length of the spiral winding and the frequency of power supply 32. Thus, the Examiner's position that Blalock et al discloses most of the features of claims 25 and 28 is wrong.

Newly added claim 31, upon which claims 32 and 33 depend, as well as method claim 1, distinguishes over the art of record by requiring controlling operations which involve (1) varying the total amount of the power applied to plural parallel connected windings so that for different distributions of electromagnetic fields, different amounts of total power are applied to the plural parallel connected windings and (2) varying the amount of current

applied to individual plural windings of the coil so that for different distributions of electromagnetic fields, different amounts of current are applied to the individual windings. The applied art fails to disclose such a controller or make such a controller obvious.

Applicants note the indication of claims 17, 18 and 20-23 containing allowable subject matter.

In view of the foregoing amendments and remarks, favorable reconsideration and allowance are respectfully requested and deemed in order.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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Susan W. Weinberg

MARKED-UP VERSION SHOWING CHANGES

1. (amended) A method of controlling the distribution of electromagnetic fields launched by an excitation coil to excite a plasma in a vacuum plasma processor for processing a workpiece, the coil including plural parallel connected windings for coupling electromagnetic fields to plasma in the chamber, the method comprising [controlling] varying (a) the total amount of power applied to the plural parallel connected windings so that for different distributions of electromagnetic fields different amounts of total power are applied to the plural windings, and (b) the amount of current applied to individual plural windings so that for different distributions of electromagnetic fields different amounts of current are applied to the individual windings.

5. (amended) The method of claim 1 wherein each winding includes first and second terminals, the first terminal being connected via a first series capacitor to an output terminal of a matching network driven by a source of the power, the second terminal being connected via a second series capacitor to a ground terminal, the [controlling] varying steps for the current in the individual windings being performed by [controlling] varying the value of at least one capacitor associated with each individual winding and the total power in the windings.

7. (amended) The method of claim 6 wherein the maintaining and changing steps are performed by [controlling] varying the values of impedances associated with the individual windings and the total power applied to the coil.

11. (amended) An inductive plasma processor for processing a workpiece, comprising a plasma excitation coil, the coil including plural parallel connected windings, a source for supplying power to the plural parallel connected windings, variable impedance arrangements respectively coupled with the plural parallel connected windings for [controlling] varying the currents

flowing from the source to each of the plural parallel connected windings, and a controller for [controlling] varying the total power the source supplies to the plural parallel connected windings and components of the variable impedance arrangements.

12. (amended) The processor of claim 11 wherein the controller is arranged for [controlling] varying the total power and the variable impedance arrangements so that for different distributions of electromagnetic fields generated by and supplied by the different windings to the plasma the current flowing in one of the windings remains substantially constant and the current in the [remainder] remaining windings of the coil changes.

13. (amended) The processor of claim 12 wherein each of the impedance arrangements includes a variable reactance coupled to its respective winding, the variable reactance of each impedance arrangement being arranged for [controlling] varying the location of the maximum amplitude of a standing wave current in its respective winding, the controller being arranged for [controlling] varying the values of the variable reactance of each impedance arrangement.

15. (amended) The processor of claim 12 wherein each of the impedance arrangements includes a variable reactance coupled to its respective winding, the variable reactance of each impedance arrangement being arranged for [controlling] varying the value of the maximum amplitude of a standing wave RF current in its respective winding, the controller being arranged for [controlling] varying the value of the variable reactance of each impedance arrangement.

17. (amended) The processor of claim 12 wherein the source is an RF source, each of the windings including first and second end terminals and each of the impedance arrangements includes first and second variable capacitors, each of the first capacitors being connected in series with its respective first terminal for

supplying RF energy from the RF source to the respective winding, each of the second capacitors being connected in series between its respective second terminal and ground, the controller being arranged for [controlling] varying the values of the first and second variable capacitors.

19. (amended) The processor of claim 12 wherein the source is an RF source, the frequency of the RF source and the length of the windings being such that there are no substantial standing wave current variations along the length of each winding, and each variable impedance arrangement includes a single variable reactance coupled with each winding, the controller being arranged for [controlling] varying the value of the variable reactance to control the maximum amplitude of the standing wave current in each winding.

20. An inductive plasma processor for processing a workpiece, comprising a plasma excitation coil, the coil including plural parallel connected windings, a source for supplying power to the plural parallel connected windings, impedance arrangements respectively coupled with the plural parallel connected windings, the power of the source and the values of reactances of the impedance arrangements being such that (a) the maximum amplitude of a standing wave current in one of the windings differs from the maximum amplitude of a standing wave current in the remainder of the coil and (b) adjacent windings have standing wave current maxima that are radially opposite to each other.

21. (amended) The processor of claim 20 wherein each of the windings is arranged for coupling an electromagnetic field to plasma in the chamber, one of the windings being an exterior winding located so electromagnetic fields generated by it is in proximity to a peripheral wall of the chamber, the remainder of the coil being arranged so electromagnetic fields generated by the remainder of the coil are remote from the chamber peripheral wall,

the controller being arranged to cause the values of the total power the source supplies to the coil and of the reactances to be [being] such that the electromagnetic field generated by the exterior winding exceeds the electromagnetic field generated by the remainder of the coil.

22. (amended) The processor of claim 20 wherein each of the windings is arranged for coupling an electromagnetic field to plasma in the chamber, one of the windings being an exterior [windings] winding located so an electromagnetic field generated by it is in proximity to a peripheral wall of the chamber, the remainder of the coil being arranged so electromagnetic fields generated by the remainder of the coil are remote from the chamber peripheral wall, the controller being arranged to cause the values of the total power the source supplies to the coil and the reactances to be [being] such that the electromagnetic field generated by the exterior winding is less than the electromagnetic field generated by the remainder of the coil.

23. (amended) The processor of claim 20 wherein each of the plural parallel connected windings is arranged for coupling an electromagnetic field to plasma in the chamber, one of the windings being an exterior winding located so an electromagnetic field generated by it is in proximity to a peripheral wall of the chamber, the remainder of the coil being arranged so electromagnetic fields generated by the remainder of the coil are remote from the chamber peripheral wall, the controller being arranged to cause the values of the total power the source supplies to the coil and of the reactances to be [being] such that the electromagnetic field generated by the exterior winding is about the same as the electromagnetic field generated by the remainder of the coil.

25. (amended) An inductive plasma processor for processing a workpiece, comprising a plasma excitation coil, the coil

including plural connected parallel windings, a source for supplying power to the plural parallel connected windings, impedance arrangements respectively coupled with the plural parallel connected windings, the source frequency and the lengths of the windings being such that there are no substantial standing wave current variations along the length of each winding, the impedance arrangement coupled with each winding being arranged for controlling the value of the standing wave current in the respective winding.

26. (amended) A method of controlling the plasma flux distribution on a workpiece of an inductive plasma processor including a plasma excitation coil having a center axis and plural parallel connected windings adapted to be driven by an excitation source, the plural parallel connected windings being concentric with the axis so an exterior winding of the coil surrounds the remainder of the coil, the method comprising positioning the exterior winding relative to the remainder of the coil so the plasma density incident on the workpiece has a predetermined desired relationship.

28. (amended) An inductive plasma processor for processing a workpiece, comprising a plasma excitation coil, the coil including at least one winding, a source for supplying power to the at least one winding, [impedance arrangements respectively coupled with the parallel windings,] the source frequency and the length of the at least one winding being such that there are no substantial standing wave current variations along the length of the at least one winding[, the impedance arrangement coupled with each winding being arranged for controlling the value of the current in the respective winding].